



Fresh concrete and admixture for fresh concrete

The invention relates to the composition of fresh concrete and admixtures for fresh concrete and can be used in the construction industry for producing monolithic and precast concrete and reinforced concrete structures, in spraying mixtures and also in the oil extraction industry when producing injection and insulation cement materials.

Fresh concrete which contains Portland cement (e.g. 32.5 cement corresponding to Russian M400) as well as quartz sand, coarse gravel, water, glycerol and admixtures of the following components (in percent by mass) is known: fixing salt 8.3-12.0, sodium thiocyanate 16-20, arsenic compounds 0.002-0.02, water 72.0-75.7 and the following ratio of components of the fresh concrete (in percent by mass): cement 10-16, coarse gravel 38-62, sand 25-40, glycerol 0.005-0.048, admixtures 0.05-0.25, remainder water (patent of the Russian Federation No. 2081083, 1997).

A lubricant for fresh concrete in the form of a complex modifier comprising the following components (in percent by mass) is known: dispersed mineral component based on silica of the rock type group (product of the clearing of furnaces which melt crystalline limestone and/or ferrosilicochromium and/or silicocalcium and/or fire anthracite) 51.9-94.1. Salts of organic acids 4.7-45.5 and water (remainder) (patent of the Russian Federation No. 2160723, 12.20.2000).

The closest prior art to the fresh concrete which is the subject of the application is fresh concrete which contains cement as well as coarse and/or fine aggregate comprising eruptive rock, metamorphite or stratified rock, iron slag or expanded blast furnace slag, expanded clay construction sand and/or sand, water and admixtures of the following components (in percent by mass): microsilica or pearlite or diatomite or trepel 50-65, superplasticizer C-3 15-20, resin attracting neutralized air or hydrophobized silicone powder 0.1-0.5, Lignopan having a molecular weight of 10-50 kJ 10-12, the content of the admixture in the fresh concrete being from 1 to 5 percent of the cement mass.

The closest prior art to the admixture which is the subject of the application is the admixture for fresh concrete comprising the following components (in percent by mass): microsilica or pearlite or diatomite or trepel 50-65, superplasticizer C-3 15-20, resin attracting neutralized air or hydrophobized silicone powder 0.1-0.5, Lignopan having a molecular weight of 10-50 kJ 10-12 (patent of the Russian Federation No. 2177919, 01.10.2002).

The object of this invention is the acceleration of the setting and hardening of the fresh concrete and an increase in the strength of the concrete.

- 5 This object is achieved if, in the fresh concrete which contains cement, coarse and/or fine aggregate as well as water and admixtures with superplasticizer C-3, hydrophobing agent (139-282) and Lignopan B (Russian Application No. 2004130768 of October 21, 2004) having a molecular weight of 10-50 kJ, the admixture indicated comprises antifoam as hydrophobing agent and fixing salt
10 and/or ammonium thiocyanate and/or sodium and/or sodium sulfate (Na_2SO_4) and sodium carbonate having the following ratio of components (in percent by mass):

	superplasticizer C-3	0-40
	the hydrophobing agent indicated	0.02-0.06
15	the Lignopan B indicated	10-20
	fixing salt and/or ammonium thiocyanate and/or sodium and/or sodium sulfate	40-55
	sodium carbonate	1-2

- 20 having a content of the admixture of 0.6-1.5 percent of the mass of cement. The fresh concrete may contain cement, aggregate and water in the following ratio, kg/m^3 : cement 300-520, aggregate 1590-2030, water 105-200, coarse or fine aggregate, coarse gravel and/or construction sand as coarse aggregate having a particle size of 5-20 or 5-40 mm, as fine aggregate sand having a particle size of not
25 more than 5 mm, at least one component from the following group: quartz sand, eruptive rock, metamorphic sand, expanded clay sand, iron slag sand and at least one component from the following group as coarse aggregate: eruptive rock gravel, metamorphic gravel, sedimentary rock gravel, iron slag sand, crushed expanded clay, crushed expanded slag.

- 30 The object indicated is also achieved if lubricant for fresh concrete contains superplasticizer C-3 as well as hydrophobing agent and Lignopan B having a molecular weight of 10-50 kJ, antifoam as hydrophobing agent (139-282) and fixing salt and/or ammonium thiocyanate and/or sodium and sodium carbonate with the
35 following ratio of components (in percent by mass):

	superplasticizer C-3	0-40
	the hydrophobing agent indicated	0.02-0.06

the Lignopan B indicated	10-20
fixing salt and/or ammonium thiocyanate and/or sodium and/or sodium sulfate	40-55
sodium carbonate	1-2

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The following components can be used in the fresh concrete:

10 binder – Portland cement, pozzolana Portland cement, slag Portland cement, rapidly hardening Portland cement, high-alumina cement in a quantity of 300 – 520 kg/m;
coarse aggregate of particle size 5-10 mm or 5-20 mm or 5-40 mm – at least one component of the following group: eruptive rock gravel, metamorphic gravel, sedimentary rock gravel, dumped crushed blast furnace slag, granulated blast furnace slag, crushed expanded clay, crushed expanded slag.

15 Fine aggregate having a particle size of not more than 5 mm – at least one component of the following group: quartz sand, quartz arkose, limestone sand, eruptive or metamorphic rock sand, iron slag sand and expanded clay sand. The total content of the aggregate in the fresh concrete is from 1590 to 2030 kg/m³, water 105-200 kg/m³.

20 The ratio of components in the fresh concrete may vary according to the required concrete variety and method of shaping.

The following components may be used for mixing the admixture:

25 Lignopan B – electrolytically modified lignosulfonates having a molecular weight of 10-50 kJ.

hydrophobing agent antifoam

silicone emulsion (139-282) (Russian quality specification 6-02-1-529-86)

30 superplasticizer C-3 (Russian quality specification 6-36-0204229-625-90)

fixing salt (Russian quality specification 2141-084-00209527-99)

ammonium thiocyanate

sodium carbonate,

35 it being possible for fixing salt and ammonium thiocyanate to be added as pure product and/or to be present in a product, for example Koxochemie production. The admixture is made by mixing the components indicated. Compositions of the

admixture are shown in table 1. The admixture is used in an amount of 0.6-1.5 percent of the cement mass.

5 The composition of the fresh concrete and the characteristics of the concrete with this admixture are shown in table 2.

Note: the following compositions of the admixture from table 1 are used in the examples in table 2:

- 10 Example 2 – composition 1
- Example 4 – composition 2
- Example 6 – composition 3
- Example 8 – composition 4
- Example 10 – composition 1
- 15 Example 12 – composition 2
- Example 14 – composition 3

20 The test findings indicated show the high efficiency of the admixture Lignopan B-2 according to the invention, the use of which in the concrete in the amount of 0.6-1.5% of the cement mass makes it possible to produce a fresh concrete having accelerated setting and hardening behavior and to achieve a higher strength of the concrete.

Table 1

Components	Content, parts by mass						
	1	2	3	4	5	6	7
sodium carbonate	1	1	2	2	1	2	1
139-282	0.02	0.04	0.04	0.06	0.04	0.02	0.06
superplasticizer C-3	0	20	40	30	20	40	30
Lignopan	10	20	15	20	10	20	20
fixing salt	55		40	40	40	-	-
ammonium thiocyanate	-	20	5	-	-	-	5
sodium thiocyanate	-	30	-	5	-	-	5
sodium sulfate	-	-	-	-	10	50	40

Table 2 The composition and the characteristics of the fresh concrete comprising the admixture LIGNOPAN B-2

N	Concrete composition					Fresh concrete characteristics			Compressive strength, Mpa	
	cement	sand*	gravel*	water**	admixture* *	slump	water/cement	color	acidic-alkaline	acidic
1	300	860	1050	150	-	3	0.5	2	9.5	22.3
2	300	860	1050	170	7	3	0.37	2.77	19.8	32.7
3	380	730	1000	222	-	17	0.58	1.73	5.9	26.7
4	?	730	1000	169	7.5	77.5	0.42	2.37	70.7	37.5
5	400	670	1090	165	-	7.5	0.42	2.38	7.9	32.7
6	400	670	1090	124	0.7	7	0.37	3.23	74.7	45.4
7	450	690	1050	247	-	18	0.55	1.82	11.8	32
8	450	690	1050	160	7.4	18.5	0.36	27*	22.4	46.5
9	480	700	1000	220	-	19	0.46	2.18	10.5	37.8
10	480	680	1000	176	7.2	19	0.37	2.77	22.7	54.6
11	520	680	1100	202	-	12	0.39	2.57	17.9	45.3
12	520	680	1100	176	0.9	72	0.34	2.95	37.2	67.4
13	550	850	800	214	-	1.5	0.39	2.57	26.8	50.2

* B

5 ** liter

*** percent of the cement mass

14	550	850	800	7*7	0.6	7.5	0.33	3.03	36.7	<<7.3
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